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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/748,565	12/30/2003	Bryan M. White	884.864US1	8030
21186	7590	11/30/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			IM, JUNGHWA M	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 11/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No. 10/748,565	Applicant(s) WHITE ET AL.	
	Examiner Junghwa M. Im	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 18 September 2006.  
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 7-11 and 17-25 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
 6) ☒ Claim(s) 7-11 and 17-25 is/are rejected.  
 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) ☐ All b) ☐ Some \* c) ☐ None of:  
 1. ☐ Certified copies of the priority documents have been received.  
 2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/3/04, 10/05</u> | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7-11 and 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dangelo et al (9S 7109581), hereinafter Dangelo in view of Uang et al. (6989325), hereinafter Uang and Brown et al. (US 6340822), hereinafter Brown.

Regarding claims 7, 11 and 17, Fig. 4 of Dangelo shows an integrated circuit package, comprising

a die/IC 402;

a heat sink 404, and

a thermal intermediate portion 408 comprising a plurality of carbon nanotubes (MWCNT), the one end of some nanotubes perpendicularly bonded to the heat sink through a chemical process.

Fig. 4 of Dangelo fails show that a coating of gold on both of the die and the heat sink. Uang discloses an IC package comprising at least two die or substrate each having a coating of gold 32, 54 thereon and Fig. 3. Uang further discloses that the each ends of the carbon nanotubes include an amide and/or thiol based linker (organic moieties) to attach the nanotubes to the metal surfaces (col. 2, lines 58-68). It would have been obvious to one of ordinary skill in the art at the

time the invention was made to incorporate the teachings of Uang in order to coat both of the die and the heat sink with gold and tether the nanotubes to the metal surfaces for better conductivity.

The combination of Dangelo/Uang fails to show a first and a second thermal intermediate portions. Fig. 6 of Brown shows nanotubes having two portions 4a, 4b and one end bonded to the die 10' and the other end to the substrate 10. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have two portions of second thermal intermediate portions each bonded to a die and a heat sink with the teachings of Brown to improve heat dissipation.

Note that the device of Dangelo could be a DRAM since Dangelo's device is an IC.

Regarding claims 8-10 and 19-21, Uang discloses that the each ends of the carbon nanotubes include an amide and/or thiol based linker (organic moieties) to attach the nanotubes to the metal surfaces (col. 2, lines 58-68).

Regarding claim 18, Dangelo discloses that a die is an IC, therefore, it would be a part of the processor.

Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dangelo in view of Uang, Brown and Yoshida et al. (US 41669911), hereinafter Yoshida.

Regarding claims 22-23, the combination of Dangelo/Uang/Brown shows all the aspects of the claimed invention as discussed in claims 1 and 17 including the each ends of the carbon nanotubes include an amide and/or thiol based linker (organic moieties) to attach the nanotubes to the metal surfaces except the nanotubes are cut. Yoshida shows that the nanotubes are cut

(col. 4, lines 27-29). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the nano tubes cut with the teachings of Yocshida to disperse them.

### ***Response to Arguments***

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard T. Elms can be reached on (571) 272-1869. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

jmi

DOUGLAS W. OWENS  
PRIMARY EXAMINER

*Douglas W. Owens* 11/25/06